The

Kentucky Geological Survey

WILLARD ROUSE JILLSON
DIRECTOR AND STATE GEOLOGIST

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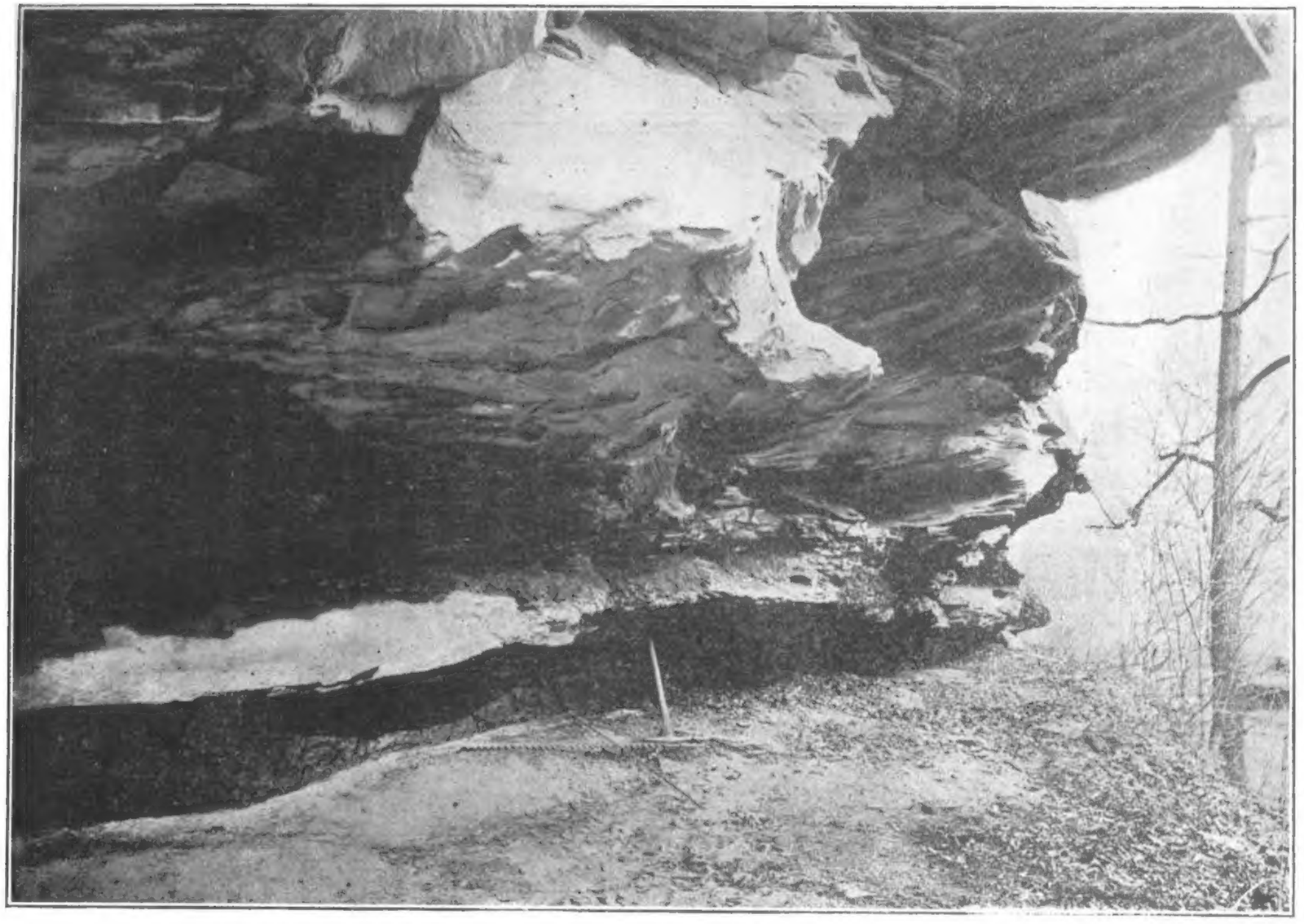

THE WHITESBURG COAL AND SANDSTONE "ROCKHOUSE" ROOF.

This characteristic view of the well known Whitesburg coal and its superimposed thirty feet of cliff forming sandstone may be seen on Otter Creek just above its juncture with the Middle Fork of the Kentucky River in Perry County.

THE
SIXTH GEOLOGICAL SURVEY

An Administrative Report of the Several Mineral Resource and General Geological Investigations Undertaken and Completed in Kentucky during the Biennial Period 1920-1921

By

WILLARD ROUSE JILLSON
DIRECTOR AND STATE GEOLOGIST

PRESENTED WITH TEN SEPARATE MISCELLANEOUS GEOLOGICAL PAPERS

BY

GEORGE P. MERRILL,
STUART WELLER
WILLARD ROUSE JILLSON
STUART ST. CLAIR
AND
CHARLES STEVENS CROUSE

Illustrated with 101 Photographs Maps and Diagrams

First Edition

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PREFACE

Applied geology is of great economic value to every State in which natural resources are only partly developed. This is especially true of Kentucky where the great body of mineral resources are now less than 20% under commercial operation. An ideal arrangement would be one where the State would have completed the base (topographic) mapping and the preliminary geological-resource surveys prior to the opening up of any oil, coal, natural gas, asphalt or other field. During the period of proving up such a field, State employed geologists could well work hand in hand with the operators, and assist them greatly in their efforts to win the resources desired.

Unfortunately this ideal arrangement has never existed in Kentucky, though it has to some extent in other States. With only 46% of Kentucky base (topographic) mapped, and with an area approximating that of sixty counties not covered by any accurate maps at all, the function of the Kentucky Geological Survey has always been crippled and held in restraint. The day of a 100% efficiency of the Kentucky Geological Survey seems yet to be in the distant future.

During the last biennium a large number of subjects of great economic value to this State have been investigated, however, by the Kentucky Geological Survey. A full account of these investigations is presented herewith in the first paper of this volume entitled, "The Sixth Geological Survey." A number of these economic papers are included within the covers of this book, and should assist materially in an understanding of the geology and resources of the several regions covered. This report is issued in an original edition of one thousand copies.

W. R. Jillson

Director and State Geologist.

Old Capitol,
Frankfort, Kentucky.
December 15, 1921.

CONTENTS

ILLUSTRATIONS

THE SIXTH
GEOLOGICAL SURVEY

III

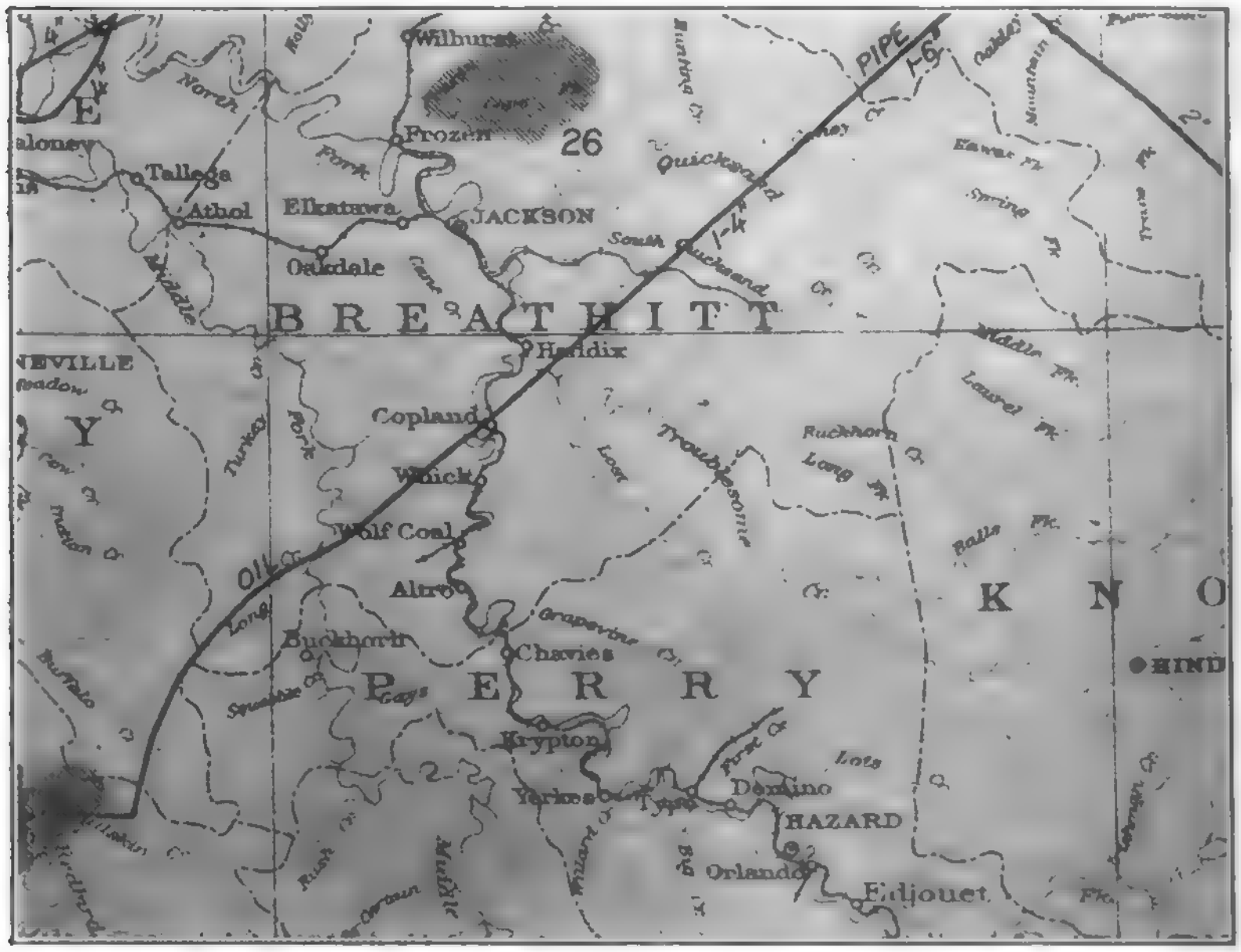
GEOLOGY AND COALS OF THE MIDDLE FORK OF THE KENTUCKY RIVER NEAR BUCKHORN IN PERRY AND BREATHITT COUNTIES

By Willard Rouse Jillson,
Director and State Geologist.

LOCATION AND FIELD WORK.

The area herein to be discussed is located in the heart of the Eastern Kentucky coal field. It lies generally from ten to fifteen miles slightly to the southwest of Jackson, the seat of Breathitt County, and about fifteen to twenty miles northwest of Hazard, the seat of Perry County. Situated on the waters of the Middle Fork of the Kentucky River and some of its tributaries, the Buckhorn section is removed from the nearest line of transportation, the L. & N. Railroad, on the North Fork of the Kentucky River, from two to ten miles. In an airline, the little mountain town of Buckhorn, which is located in the center of this area, is about 75 miles southeast of Lexington, Kentucky, but by railroad, wagon road, or trail, it is over 100 miles. The Buckhorn section is slightly south of the latitude 37° 30′, and nearly bisected by longitude of 83° 30′.

The data presented herewith is based upon the writer's personal investigations in the field from February 3rd to February 10th, inclusive, 1921; and April 20th to April 23rd, inclusive, 1921. Examinations were made along a route from Altro on the North Fork up Bush Creek to and down the Left Fork of Gays Creek to the Middle Fork of the Kentucky River, and thence to Buckhorn. Squabble Creek in the vicinity of Buck-



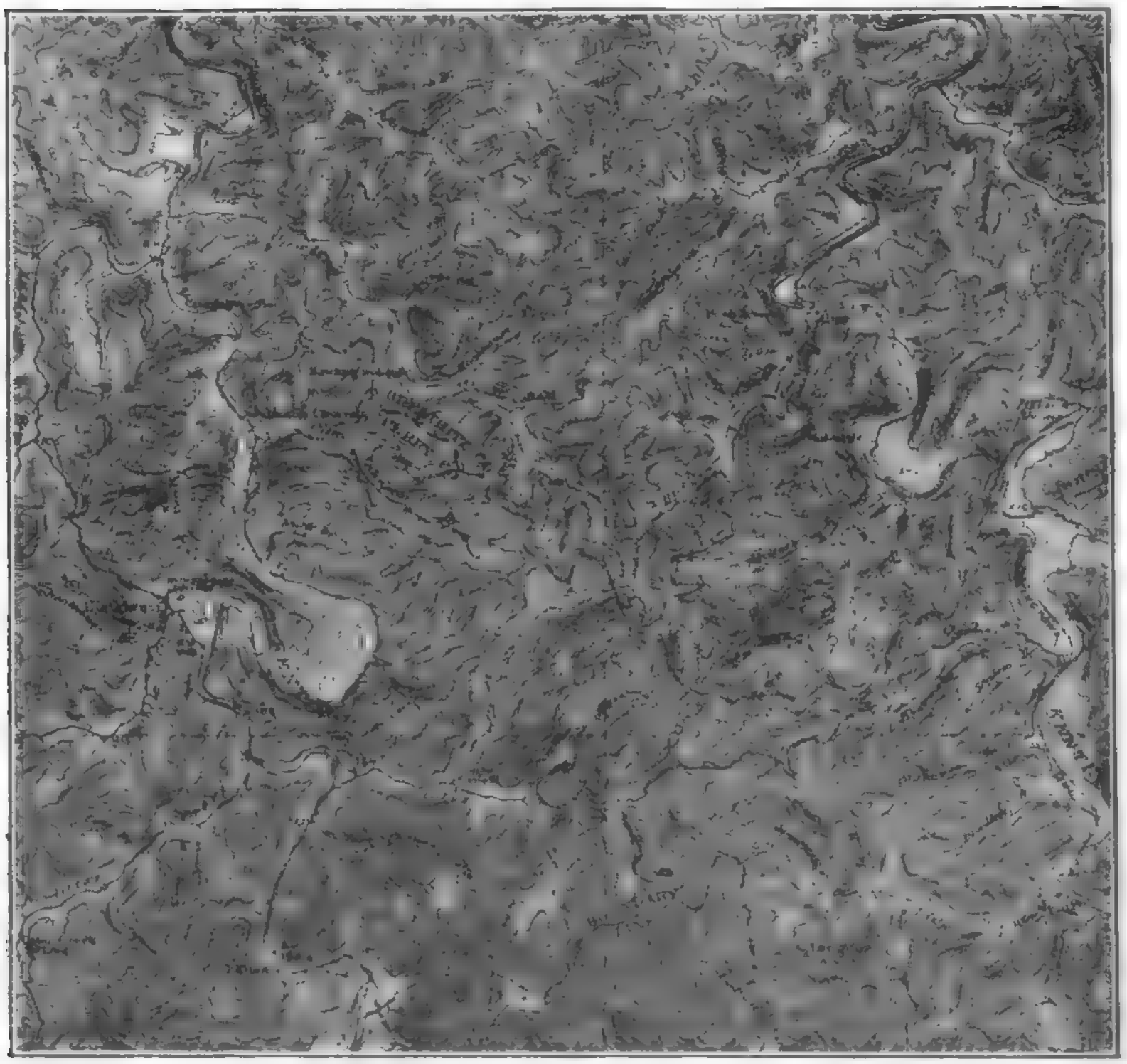
OUTLINE MAP OF THE BUCKHORN REGION.

It will be readily seen that although railroad transportation skirts this region on the right on the North Fork, the Buckhorn section on the Middle Fork of the Kentucky River is actually isolated.

horn was then covered; thence up Otter Creek to its head; thence down the Middle Fork of the Kentucky River and its shorter tributaries, Buck Branch and Cam Johnson Branch, and up Johnson's Fork and Riley's Fork of Long's Creek. Thence the route lead down the Middle Fork of the Kentucky River, and up Bowling's Creek to its head, and back down Bush Creek to Altro Station. Another later route of examination started at Chavies Station on the North Fork of the Kentucky River, up Eversole Creek and down the Right Fork of Gays Creek to Otter Creek and Buckhorn, and thence back over Gays Creek to Chavies. No examinations were made on Turners Creek and Lick Creek, due to the lack of adequate openings on these streams. The photographs included within this report were made by the writer in the field, under the certain handicaps of rainy and foggy, though mild, weather.

ALTRO, BREATHITT COUNTY, KY.

The North Fork of the Kentucky River in the middle background has developed a series of cliffs in the Pottsville on the outside of a local meander. The Louisville and Nashville Railroad right of way is in the foreground.



OUTLINE MAP OF BUCKHORN REGION.
Buckhorn is located in the western central portion of the map. The topography is quite characteristic of the Cumberland Plateau in Kentucky.

Practically all of the openings examined were wet, that is, dammed up by slips or natural dip, and contained amounts of water ranging in depths from 6 inches to 4½ feet. A considerable amount of time, and not a little labor, was required to drain these entries, in order to allow for measurement, channel sampling, and photographing. The geologic coal section for this report is given as at Buckhorn, because of the larger number of openings in that vicinity than at any other one place, and because of its semi-central position in the area reported upon. All of the coals in the section, however, were not opened and hence not examined at Buckhorn. Many were found in the adjacent territory and brought into this section

PANORAMA OF BUCKHORN, KY.

Witherspoon (Presbyterian) College and Campus are seen in the foreground. Native residences and stores are strung out to the right and left on the branches of Squabble Creek.

and correlated by means of barometric elevations and special characteristics.

In the section covered, all of the known openings were inspected, including those of commercially operated mines of the Eversole and Bush Creek sections on the North Fork of the Kentucky River, as well as the sporadically operated domestic mines on the Middle Fork of the Kentucky River. Great courtesy was extended to the writer by many individuals within this area, who spared no effort to give complete information as to the location of the domestic openings. Officials of the Johnson-Hogge Coal Co., the largest individual operator on Eversole Creek, were especially courteous in allowing a special inspection of their several mines, and assisting in the sampling of the coals therein operated.

GEOLOGY.

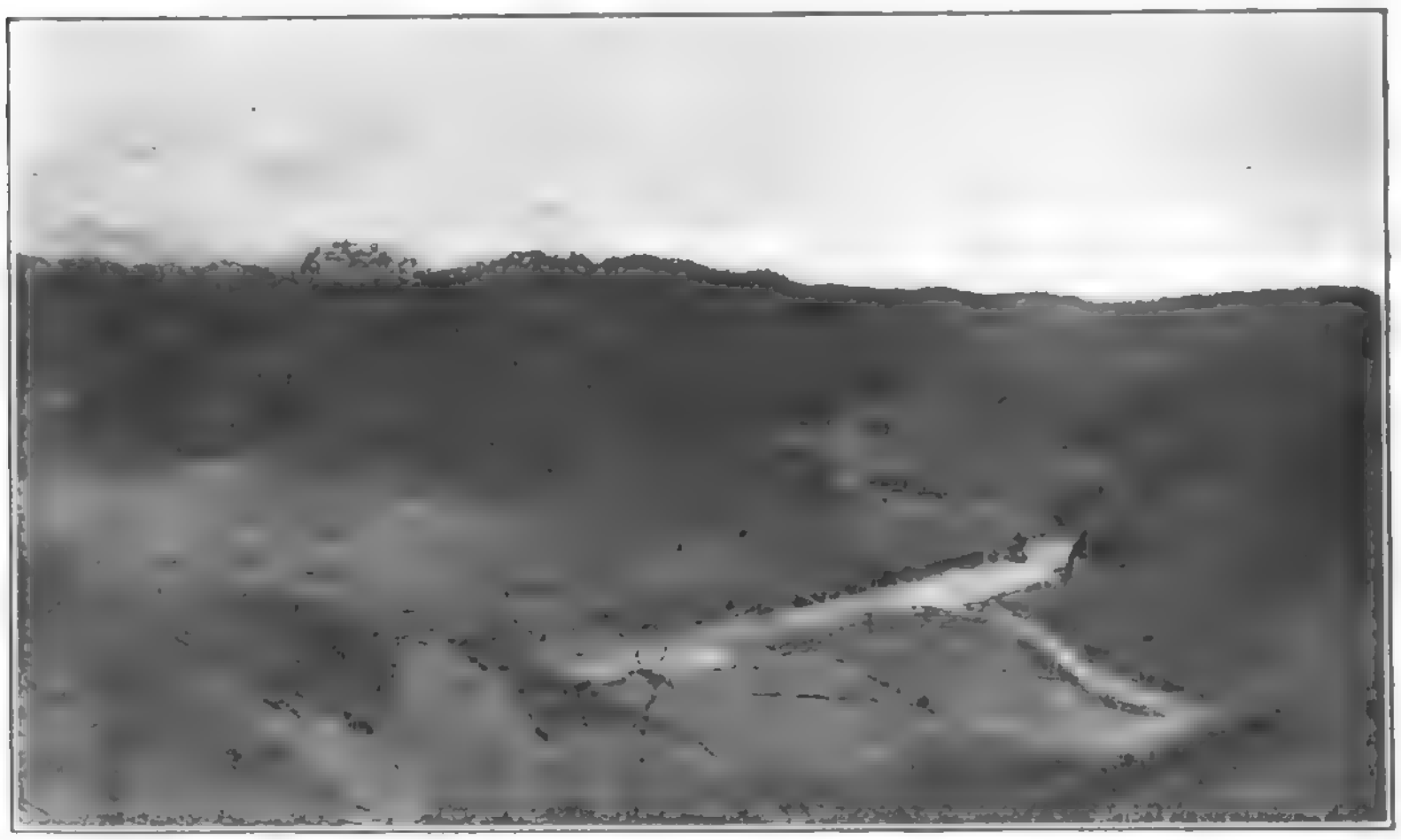
Topography, Stratigraphy and Coals.

The highest elevation within the area is slightly over 1,600 feet A. T. This altitude is found on the divide between the Middle Fork and South Fork of the Kentucky River. The minimum

LONG'S CREEK AFTER A HARD RAIN.

elevation is found near the mouth of Bowling's Creek in Breathitt county, and is 700 feet A. T. at low water. At Buckhorn, which is located on Squabble Creek at its juncture with the Middle Fork of the Kentucky River, the drainage floor is 730 feet at low water.

The topography of the region is a unit with that of the interior of the Eastern Kentucky coal field, consisting of an adjusted intricate system of typically dendritic drainage deeply incised into the Cumberland plateau. The ridges, which are uniformly sharp and timbered in second growth and virgin culls, give a widespread and outstanding accordance of summit levels. The valleys are narrow, meandering and generally under cultivation. The roads—better described as trails find-



THE MOUTH OF OTTER CREEK.

One stands at the elevation of the Hazard coal and the view is up the Middle Fork of the Kentucky River. Characteristic Pottsville topography.

ing their way in and along the creeks—are either uniformly bad or impassable. The inhabitants, the direct descendants of the original sturdy pioneers, though living generally in log homes, with somewhat primitive surroundings, have preserved for the interested coal prospector or occasional traveler that rare, abundant hospitality which has long been characteristic of the Kentucky mountaineer and his home land.

A COMFORTABLE MOUNTAIN HOME.

This residence is a double two story, weatherboarded, log cabin, and is typical of the better old-time homes of this hill region. It is owned by F. J. Johnson, and is located on the Cam Johnson Branch of the Middle Fork of the Kentucky River.

The rocks exposed at the surface of the area under discussion are those of the Middle and Lower Pottsville formations, the basal divisions of the Pennsylvanian System. A considerable thickness of these rocks including the Pottsville Conglomerate is to be found below drainage levels by well drilling or coreing. Above drainage, and forming the subject matter of this report, there is a maximum thickness of about 900 feet of alternating sandstones, shales and coals.

In the 900 feet of exposed strata there were found and definitely correlated in the field eleven coals. This enumeration classifies the Fire Clay or No. 4 coal and the Fire Clay Rider coal as separate coals. The enumeration begins at the Whitesburg or No. 3 coal, at 750 to 770 feet A. T., and goes up through Hindman or No. 9 coal at elevations ranging between 1,385 and 1,400 feet. The sequence of coals in ascending order as found follows: Whitesburg, or No. 3 coal; Stray coal B.; Stray coal C.; Fire Clay, or No. 4 coal; Fire Clay Rider Coal; Hamlin

coal; Haddix, or No. 5 coal; Hazard, or No. 6 coal; Flag, or No. 7 coal; Francis, or No. 8 coal; Hindman, or No. 9 coal.

BOWLING CREEK, BREATHITT COUNTY, KY.

The view is up the creek on the farm of Richard Combs. Note the road is in and out of the creek, which is foot bridged high enough to allow wagons to pass beneath. Note rapid erosion on barren hillside at the right.

A tabular presentation of these several coals is given below, wherein fuller information concerning their locations, thicknesses and relative positions in the geologic section may be secured:

SUMMARY OF COAL THICKNESSES.

(Partings are not included.)

Elev. Coal	Name of Coal	No. of Exam.	Location and Measurement
1385	Hindman	(34)	Gays Creek, 34 in. coal.
1350	Francis	(37)	Gays Creek, unopened, unmeasured.
1315	Flag	(38)	Gays Creek, unopened, unmeasured.
		(20)	Groundhog, Long's Creek, 57 in. coal.
		(36)	Eversole Ck., 35 in. coal.
		(39)	Gays Creek, fallen in. Rept. 40 in.
1250	Hazard	(1)	Middle Fork, 66 in. coal.
		(6)	Otter Creek, 50 in. coal.
		(35)	Eversole Creek, 24 in. coal.
1150	Haddix	(19)	Johnson's Fork, Long's Ck., 34 in. coal.
		(18)	Johnson's Fork, Long Ck., 27 and 21 in. coal.
1090	Hamlin	(7)	Otter Creek, 16 in. coal.
		(3)	Squabble Ck., 38 in. coal, solid.
		(26)	Eversole Ck., 29 in. coal.
		(27)	Eversole Ck., 40 in. coal.
930–970	Fireclay Rider	(30)	Gays Ck., 24 in. coal.
		(31)	Gays Ck., 33 in. coal.
		(16)	Cam Johnson Branch, 45 in. coal.
		(22)	Bowling Creek, 29 in. coal.
		(28)	Eversole Creek, 53 in. coal.
		(29)	Eversole Creek, 92 in. coal.
925–960	Fireclay	(30)	Gays Creek, 43 in. coal.
		(33)	Gays Creek, 39 in. coal.
		(15)	Buck Branch, 40 in. coal.
		(40)	Gays Creek, 18 in. coal.
		(2)	Squabble Creek, 35 in. coal.
750–770	Whitesburg	(10)	Squabble Creek, 24 in. coal, solid.
		(14)	Buck Branch, 20 in. coal.
		(17)	Riley's Fork, Long's Ck., 28 in. coal.
725–790 and up-Middle Fork Drainage Level			
680–690	Sub "A"		Variously reported, unmeasured.

STANDARD CORRELATION OF THE COALS OF THE BUCKHORN REGION IN PERRY AND BREATHITT COUNTIES, KY.

Elev. Coal	Hazard Field Nomenclature	Hazard Field Coal Number	Exam. No. This Rept.	Creek Location
1385	Hindman	No. 9	No. 34	Gays
1350	Francis	No. 8	No. 37	Gays
1315	Flag	No. 7	No. 38	Gays
1250	Hazard	No. 6	No. 1, 6, 20, 36, 39	Middle Fork, Gays, Eversole, Otter, Long's.
1150	Haddix	No. 5	No. 19, 35	Eversole, Long's. Otter,
1090	Hamlin	.....	No. 7, 18, 21	Long's Bowling. Bowling,
930–970	Fireclay Rider	.....	Nos. 3, 16, 22, 23, 24, 25, 26, 27, 30, 31	Bush, Squabble, Cam Johnson, Gays, and Eversole.
925–960	Fireclay	No. 4	Nos. 11, 15, 28, 29, 30, 33	Gays, Squabble, Eversole. Buck Br.
870	Stray C.		Nos. 5, 8	Otter.
800	Stray B.		No. 32	Gays. Squabble.
750–770	Whitesburg	No. 3	Nos. 2, 4, 9, 10, 13, 14, 17, 40	Otter, Gays. Middle Fk., Ky. River, Long's.
725–790 and up.	Middle fork of the Kentucky River Drainage Level.			
680–690	Sub "A" Coal		Not listed.	

Besides the coals named above, frequent reference was made by natives in this area to "a thick solid coal underlying the river in low water about 30 feet." This coal was never seen by the writer, due to the fact that the Kentucky River and its tributaries were high at the time of the field work, and no shaft was open to it. There can be but little doubt, however, that some coal is existent at this point, though what

its measurements and partings might show under examination cannot be suggested here. It is probably not, however, a solid coal if it is over 3 or 3½ feet in thickness. In this report this lower than river drainage coal is called the "Sub A" coal. It underlies the Whitesburg coal. Whether or not it is to be correlated with the Amburgy or a lower coal is an open question.

Structural Features.

The major structure of the Buckhorn-Crockettsville area of Middle Fork of the Kentucky River is that of a great syncline. It is in fact the Eastern Kentucky geo-syncline, the bottom of the trough between the Pine Mountain uplift on the southeast, and the Lexington Dome of the Cincinnati Arch on the northwest. The lowest points in the stratigraphic sequence

CROCKETTSVILLE, BREATHITT COUNTY, KY.

This view is at the forks of Long's Creek. The store at the left was formerly owned by Ed Callahan who was shot from ambush there in the Hargis-Cockrill feud. The topography is characteristic of the Pottsville series.

of the rocks of this region are found near Crockettsville in a basin syncline which parallels the Middle Fork of the Kentucky River, and is located astride the Perry-Breathitt County line.

The Fire Clay coal in this immediate vicinity is contoured as low as 860 feet A. T., and may be found in one or two localities as low as 850 feet A. T. The highest structural point within this area is found on the Owsley-Breathitt line, where the Fire Clay coal is contoured at 1,030 feet, or from 100 to 120 feet higher than it is on the Middle Fork. Going to the east, the strata rise into the divide between the Middle and North Forks of the Kentucky River, beneath which there is located a low, elongated dome or up-folding on the rock series. The major axis of the structure, though not a straight line, is in a generally north and south direction. The Fire Clay coal on the top of this anticline is contoured at 910 feet, a rise of 50 feet from the vicinity of Crockettsville. From the top of the watershed between these rivers the strata again slope to the east, where they again find synclinal positions on the North Fork of the Kentucky River. The Fire Clay coal at the mouth of Strong Branch is contoured at 860 feet A. T., and at the mouth of Wolf Creek 870 feet A. T.

DETAILED EXAMINATIONS OF COALS.

Examination No. 1.

Property: John Gross.

Location: Just below mouth of Otter Creek on Middle Fork of Kentucky River, Perry County, Ky.

Elevation: Coal, 1,220 feet A. T.: top of ridge, 1,375 feet A. T.

Description: Hazard coal. Old domestic mine, high on hill, adequately timbered, and in excellent condition inside. Main entry badly fallen in, impounding about 4½ feet of water. Required entire day to open, drain, measure and sample. A very commercial seam, but small acreage at this point. Acreage would be much larger back from the river or the creeks. Sampled. See analysis.

Coal Section: Gray slate roof.

15 in. coal.

12 in. gray slate.

51 in. coal (solid).

Gray sandstone bottom.

HAZARD COAL AT THE MOUTH OF OTTER CREEK.
This coal is high in the hill on the farm of John Gross and measures 50 inches exclusive of the parting.

Examination No. 2.

Property: Jim Sandlin.

Location: At Buckhorn in waters of branch of Squabble Creek flowing from the northeast below Reynolds Bros.' store. Perry County, Ky.

Elevation: Coal, 750 feet A. T. (drainage level).

Description: Whitesburg coal. Considerably used (3) domestic openings close together, adequately timbered, but shallow, badly filled with impounded water from the branch. Not a commercial seam. Very large acreage: operated.

Coal Section: Gray slate roof.

16 in. coal.

½ in. slate parting.

19 in. coal.

Gray slate bottom.

Examination No. 3.

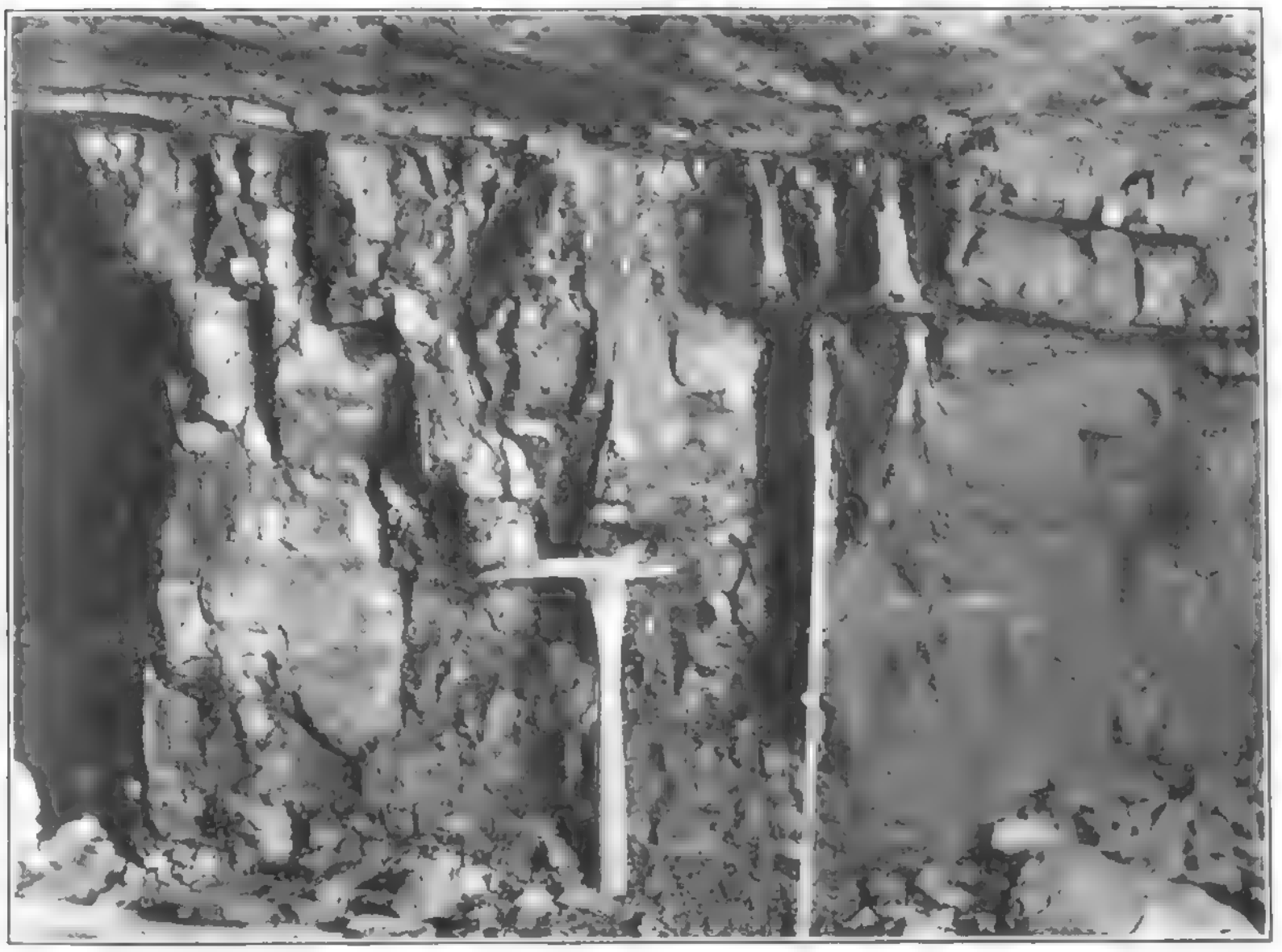
Property: Floyd Gross.

Location: At Buckhorn, half-way up hill on left side of Squabble Creek, Perry County, Ky.

Elevation: Coal, 1,000 feet A. T.; ridge, 1,250 feet A. T.

Description: Fireclay Rider coal. Operating mine used by Witherspoon College. Adequately timbered, dry. Main entry driven about 150-200 feet. Measured 38 in. solid coal 20 feet inside main entry, and reported 40 in. at face. A commercial seam. Sampled. See analysis.

Coal Section: Gray slate roof.
38 in. coal (solid).
Gray slate bottom.



THE FIRE CLAY RIDER—38 INCHES SOLID COAL.
This view is in the Witherspoon College mine on the Floyd Gross farm on Squabble Creek.

Examination No. 4.

Property: John Gross.

Location: On right side of Middle Fork of Kentucky River at right of county road and level with same, ½ mile above mouth of Squabble Creek, Perry County, Ky.

Elevation: Coal, 790 feet A. T.

Description: Whitesburg coal. Natural—unmined—outcrop badly weathered and soft. Not a commercial seam here.

Coal Section: 30 feet gray sandstone roof.
21 in. coal (would be more if faced to solid).
Shale bottom.

Examination No. 5.

Property: Lewis Strong.

Location: On left side of Otter Creek, 1½ miles above mouth, Perry County, Ky.

Elevation: Coal, 900 feet A. T.

A NEW OPENING OF THE HAZARD COAL.
This prospecting was done on the Levi Strong farm on the head of Otter Creek at an altitude of 1,230 feet.

Description: Stray coal. Old domestic opening only partly completed. This is the same coal as that underlying the black shale in the creek farther up and near the school house. Commercially unimportant.

Coal Section: Sandstone roof.

19 in. coal (solid).

6 feet slate (gray to black).

14 in. coal (solid).

Shale bottom.

Examination No. 6.

Property: Levi Strong.

Location: On left side of right fork of Otter Creek, 2½ miles above mouth of creek, Perry County, Ky.

Elevation: Coal, 1,230 feet A. T.

Description: Hazard coal. New opening, only partly completed, half-way up hill, not faced to the solid. Coal soft and rotten. Would be much thicker, especially above parting, if measured on the solid face. A very important commercial coal. Fairly large acreage.

Coal Section: Slate roof.
38 in. coal (solid).
4 in. gray slate.
12 in. coal.
Sandstone bottom.

Examination No. 7.

Property: Levi Strong.

Location: On left side of right fork of Otter Creek, 2½ miles above mouth of creek, Perry County, Ky.

Elevation: Coal, 1,090 feet A. T.

Description: Hamlin coal. New opening only partly completed, one-third distance up hill. Not faced to solid. Coal soft and rotten. Whole sequence probably not shown. The coals would be somewhat thicker if measured on solid face. A probably unimportant coal in this immediate locality, but undoubtedly important elsewhere. Large acreage here.

Coal Section: Slate roof.
18 in. bone and slate.
12 in. coal.
6 in. slate.
4 in. bone and coal.
Yellow and gray clay bottom.

Examination No. 8.

Property: Several owners.

Location: In Otter Creek just below the forks, Perry County, Ky.

Elevation: Coal, 880 feet A. T.

Description: "Stray" coal. Old domestic stripping operations in the creek bed. Black slate is lifted and the coal removed. Commercially unimportant.

Coal Section: 24–36 in. black fissile slate cover.
12–14 in. coal.
10 in. shale, yellow.

Examination No. 9.

Property: Edward Hogg.

Location: On the right of Otter Creek, three-fourths mile above mouth, Perry County, Ky.

Elevation: Coal, 790 feet A. T.

Description: Whitesburg coal. Old domestic opening fifteen feet above creek bed, under 30 feet massive sandstone. Commercially unimportant.

Coal Section: 30 feet sandstone roof.
18 in. coal.
Gray shale bottom.

Examination No. 10.

Property: Witherspoon College farm.

Location: Buckhorn, Ky. Under sandstone cliff near saw mill on Squabble Creek.

Elevation: Coal, 775 feet A. T.

Description: Whitesburg coal. Natural outcrop under very thick and massive sandstone. This coal not commercial at this outcrop.

Coal Section: 30 feet massive sandstone.
6 in. black slate.
24 in. coal.
Shale bottom.

Examination No. 11.

Property: Robert Helton.

Location: One-half mile above Buckhorn, Perry County, Ky., on left hillside of Squabble Creek.

Elevation: Coal bloom, 950 feet A. T.

Description: Fireclay coal. Slight excavations uncovered a very pronounced coal bloom. No coal faced. This coal is very probably an important one, and should be investigated thoroughly.

Coal Section: Shale roof.
Coal bloom.
Blue slate.
Thick massive sandstone bottom.

Examination No. 12.

Property: James F. Sandlin.

Location: Head of left fork of Schoolhouse branch, just east of old cabin on hillside, just above branch waters, Perry County, Ky.

Elevation: Coal, 1,000 feet A. T.

Description: Cannel slate, domestic opening of three feet. Not opened to solid face. The cannel shale found at this and other localities on Squabble and Otter Creeks is not a real cannel coal. Small splinters will occasionally ignite from a match, but the "shale" generally is too low in bituminous matter to burn freely in a grate. Not a commercial coal in this locality.

Coal Section: Gray shale roof.
12 in. cannel shale.
6 in. gray slate.
19 in. cannel shale.
5 in. gray slate.
21 in. cannel shale.
5 feet shale bottom.
18 in. coal (bituminous and good quality).
Sandstone bottom.

Examination No. 13.

Property: Jack Gross.

Location: Three-fourths of a mile up Squabble Creek and just at limits of Buckhorn, Perry County, Ky., on right side of creek.

Elevation: Coal, 760 feet A. T.

Description: Whitesburg coal. Small domestic mine. Well timbered and drained. Except for its thinness, this coal can be recommended from every angle. Very large acreage, high quality, and good roof. Measured 30 feet inside main entry. Reported thicker at face. Sampled. See analysis.

Coal Section: 30-foot massive sandstone, 4 feet black slate } roof.
33 inches coal.
Gray slate bottom.

Examination No. 14.

Property: O. B. Anderson.

Location: On Buck Branch, 2 miles below Buckhorn, Perry County, Ky., one-fourth mile up creek.

Elevation: Coal, 745 feet A. T.

Description: Whitesburg coal. Domestic opening, well drained. Not a commercial coal in this locality.

Coal Section: 30-foot massive sandstone, 6 in. to 24 in. gray-black shale } roof.
20 in. coal.
Shale bottom.

Examination No. 15.

Property: O. B. Anderson.

Location: On Buck Branch, 2 miles below Buckhorn, Perry County, Ky., three-fourths mile above mouth and Middle Fork of Kentucky River.

Elevation: Coal, 955 feet A. T.

Description: Fireclay coal. Domestic opening, partly timbered and somewhat fallen in. Badly impounded with water. A fine coal and very commercial. Sampled 50 feet from main opening, at face.

THE WHITESBURG COAL AT BUCKHORN.
This is a domestic mine on the Jerry Gross farm on Squabble Creek. The coal is 33 inches thick and is solid.

Coal Section: Sandstone roof.
28 in. coal.
4 in. bone.
12 in. coal.
Shale bottom.

Examination No. 16.
Property: G. R. Johnson.
Location: On Cam Johnson Branch, 2 miles above mouth, Perry County, Ky.
Elevation: Coal, 1,010 feet A. T.
Description: Fire Clay Rider coal. Comparatively new domestic opening half-way up right hill. Coal sharp and clean and solid. A commercial coal of good sized acreage, though carrying at this point a rather thick shale parting. Sampled. See analysis.
Coal Section: Gray shale roof.
25 in. coal.
14 in. gray shale.
20 in. coal.
Gray shale bottom.

Examination No. 17.
Property: Elihu Reynolds, 100 acres.
Location: On the Riley Fork of Long's Creek of Middle Fork of the

Kentucky River, Breathitt County, Ky.

Elevation: Coal, 750 feet A. T.

Description: Whitesburg coal. Private domestic mine 40 feet in rear of dwelling house. A very large acreage of this coal is to be found in this locality, but it is not considered a commercial seam at the present time, due to its thinness and parting. Photographed and sampled. See analysis.

Coal Section: Gray-black shale roof.

20 in. coal.
6 in. gray shale.
8 in. coal
Gray shale bottom.

FACE OF THE WHITESBURG SEAM.

This opening is on the farm of Elihu Reynolds on the Riley Fork of Long's Creek. It is 28 inches thick here and of domestic importance only.

Examination No. 18.

Property: Elihu Reynolds, 200 acres.

Location: On Johnson Fork of Long's Creek, Breathitt County, Ky., one-half way up left hillside, in hollow back of farm house.

Elevation: Coal, 990 feet A. T.

Description: Hamlin coal. New opening. Not faced to solid. Coal would undoubtedly be thicker if driven to the solid. Acreage not large, due to relatively high position on the hill. Coal shows considerable parting, but otherwise very good, though not thick.

Coal Section: Shale roof.
8 in. coal.
4 in. gray shale.
4 in. black bone.
19 in. coal.
8 feet shale bottom.
21 in. coal.
Gray shale bottom.

Examination No. 19.

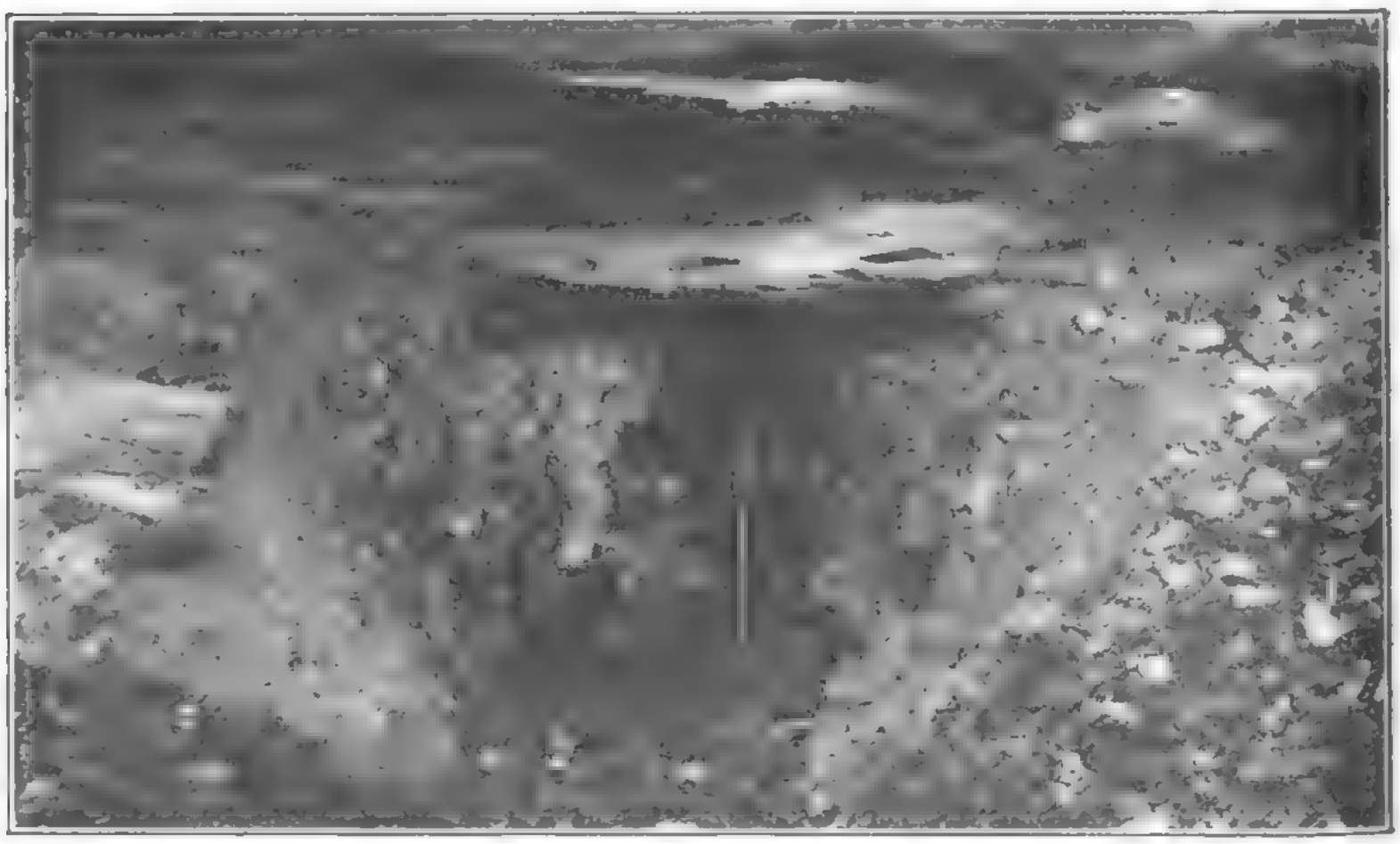
Property: Elihu Reynolds, 200 acres (same farm as No. 18).

Location: On Johnson Fork of Long's Creek, Breathitt County, Ky., about two-thirds of the way up left hillside below house.

Elevation: Coal, 1,170 feet A. T.

Description: Haddix coal. New opening. Not faced to the solid. Coal would undoubtedly be thicker if driven back. Acreage not large, due to relatively high position on the hill. Photographed.

Coal Section: Massive sandstone and shale roof.
1 in. shale.
34 in. coal.
Shale bottom.



COAL PROSPECT ON JOHNSON'S FORK OF LONG'S CREEK.
This coal is probably the Haddix. It is found on the Elihu Reynolds farm at an elevation of 1,170 feet and is 34 inches solid.

Examination No. 20.

Property: Berry Turner, Sr.

Location: 1 mile below Crockettsville, Breathitt County, Ky., on Groundhog Branch of Long's Creek, high in hillside of left fork near waterfall.

Elevation: Coal, 1,085 feet A. T.

Description: Hazard coal. Old domestic opening, partly water filled. Acreage small in this locality, due to elevation, but probably much larger toward the head of Long's Creek and other adjoining drainage. Some sulphur in thin partings. Sampled from the bottom 22 in. of "gray splint." See analysis.

Coal Section: 30 foot massive sandstone roof.

16 in. gray slate.
17 in. coal.
8 in. gray slate.
7 in. coal.
12 in. slate and coal.
11 in. coal.
6 in. slate.
22 in. coal ("gray splint").

THE HAZARD COAL—57 INCHES.
The opening is a domestic one on the Berry Turner farm on Groundhog Branch at an altitude of 1,085 feet.

Examination No. 21.

Property: Richard Combs, Sr.

Location: On Bowling's Creek, Breathitt County, Ky., one and three-fourths miles above mouth, about half-way up left hillside in hollow back of house.

Elevation: Coal, 945 feet A. T.

Description: Hamlin coal. Old domestic opening, partly timbered, partly water filled. Fair sized acreage. Sampled. See analysis.

Coal Section: Slate roof.
9 in. coal.
1 in. slate.
24 in. coal.
8 in. slate.
8 in. coal.
4 in. slate.
6 in. coal.
6 in. coal (under water).
Slate bottom.

Examination No. 22.

Property: G. B. Turner.

Location: On headwaters of Bowling's Creek, Breathitt County, Ky., one mile down stream from the gap.

Elevation: Coal, 945 feet A. T.

Description: Fireclay Rider coal. New, domestic opening. Not finished. Small amount of water impounded. A fine coal, evidently, but not thick enough at this point to be commercial. This coal reported to be 30 in. in opening, now fallen in, closed, and abandoned. Sampled. See analysis.

Coal Section: Gray slate roof.
1 in. black slate.
29 in. coal.
4 in. black slate.
Shale bottom.

Examination No. 23.

Property: Widow Mary Riley.

Location: On Bush Branch of the North Fork of the Kentucky River, Breathitt County, Ky., one and one-half miles above mouth of creek, and 20 feet above waters of the creek.

Elevation: Coal, 960 feet. A. T.

Description: Fireclay Rider Coal. Old domestic opening, badly fallen in, impounding considerable water. Not a commercial coal.

Coal Section: Slate roof.
21 in. coal.
6 in. (coal?) water covered.
4 feet black shale bottom.

Examination No. 24.

Property: Ed Turner.

Location: On Bush Branch of North Fork of Kentucky River in Breathitt County, Ky., one and one-fourth miles above creek mouth, and 40 feet above waters of creek.

Elevation: Coal, 950 feet A. T.

Description: Fireclay Rider coal. Old domestic opening, very badly fallen in, impounding large amount of water. Measured at 4 feet inside of main entry.

Coal Section: Gray shale roof.
25 in. coal.
6 in. (coal?) water covered.
Shale bottom.

THE FIRE CLAY RIDER ON BUSH BRANCH.
This seam is here well up on the hillside. It is operated by the Deaton Coal Co.

Examination No. 25.
Property: Deaton Coal Co.
Location: On Bush Branch of North Fork of the Kentucky River, in left hillside just above Altro, and one-half mile above mouth of creek and L. & N. R. R.
Elevation: Coal, 940 feet, A. T.
Description: Fireclay Rider coal. Commercial mine—not being operated at present. Main entry drifted in through coal and 2 feet of shale in bottom to give mule room and drainage. Sampled.
Coal Section: Gray slate roof.
32 in. coal.
Gray slate bottom.

Examination No. 26.
Property: Ballinger-Jones Coal Co.
Location: On the right, at the mouth of Eversole Creek, Perry County, Ky. (Davies Station.)
Elevation: Coal, 930 feet, A. T. on spur.

Description: Fire Clay Rider coal. Operating mine. Excellent roof, good property. Sampled and analyses attached to report.
Coal Section: Gray slate roof.
29 inches coal, clean.
Gray shale bottom.
Fire clay.

Examination No. 27.
Property: Johnson-Hogg Coal Co.
Location: Up branch one-sixteenth mile on right of Eversole Creek, Perry County, Kentucky.
Elevation: Coal 935 feet A. T.
Description: New facing of Fire Clay or No. 4 coal and Fire Clay Coal Rider.
Coal Section: Rider Coal.
Sandstone 8 feet.
2 feet shale roof.
40 inches coal, clean.
Shale bottom.

Examination No. 28.
Property: Johnson-Hogg Coal Co.
Location: Main Entry,[1] just above drainage one and one-half miles up Eversole Creek on the right.
Elevation: Coal 925 feet, A. T.
Description: Old-main entry and operating face of Fire Clay coal or No. 4 coal. Sampled at 2,300 feet in, analyses attached.
Coal Section: Shale roof.
A 33 in. coal, clean.
$1\frac{1}{2}$ or 2 in. black jack rock (2,300 feet in).
20 in. coal, clean.
Shale bottom.

Examination No. 29. (Same mine as No. 3.)
Coal Section: Shale roof.
B 48 in. coal, clean.
4 in. black jack rock. (100 feet in on left side entry called "Dog House").
44 in. coal, clean.
Shale bottom.
Note: Alt. of lowest point in the divide between Eversole and Gays Creeks—Stump by side of road 1,510 feet, Bar.

Examination No. 30.
Property: Joseph Sandlin farm.
Location: On the left at the bottom of the hill road to Eversole Creek on the headwaters of Gays Creek.

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[1]Note: At this point from 8 to 16 feet separate the Fire Clay or (No. 4) coal from its Rider.

DOMESTIC OPENING ON BOWLING CREEK.
There is 43 inches of coal in this seam on the Richard Combs farm but it is split by three shale partings.

Elevation: Coal, 955 feet, A. T.
Description: Fire Clay or No. 4 coal and Fire Clay Rider coal. Domestic opening. Sampled and analyses attached. Commercial.
Coal Section: Shale roof.
24 in. coal, clean.
Shale bottom
12 in. parting.
Fire Clay coal (No. 4).
Shale roof.
30 in. coal, clean.
7 in. black jack rock.
13 in. coal.
Fire Clay bottom.

Examination No. 31.
Property: H. M. Begley farm.
Location: On the left on the hill below schoolhouse on the right fork of Gays Creek, Perry County, Kentucky. One and one-half miles above mouth of the Creek.
Elevation: Coal, 955 feet, A. T.
Description: Fire Clay Rider coal. Domestic opening.

Coal Section: Shale roof.
21 in. coal.
1 in. soft shale, black.
12 in. coal.
Shale bottom.

Note: The Fire Clay or No. 4 coal is indicated by quantities of seepage water 15 feet below the above described Rider seam. It has not been opened at this place, however.

This is the main entry of the Jim Sandlin domestic mine at Buckhorn, Perry County, Kentucky.

Examination No. 32.

Property: L. Stanley farm.
Location: On right fork of Gays Creek one and one-fourth miles above mouth, Perry County, Kentucky.
Elevation: Coal, 800 feet, A. T.
Description: Stray coal un-named. Domestic opening under Black shale cliff on left of creek.
Coal Section: Black shale roof.
4 in. bone coal.
3 in. soft black shale.
16 in. coal.
Shale bottom
Massive sandstone.

Examination No. 33.

Property: Sam Morris farm.

Location: On left fork of Gays Creek just above forks on the left-hand hillside above dwelling.

Elevation: Coal, 960 feet, A. T.

Description: Fire Clay or No. 4 coal. Good domestic opening, badly impounded with water. Sampled and analyses attached.

Coal Section: Shale roof (hard and firm).
27 in. coal, clean.
5 in. shale and bone (lock rock).
12 in. coal.
Shale bottom.
Fire Clay—10–24 in. thick generally.

First note: The Fire Clay Coal Rider is exposed just a few feet above this coal. It is considered uncommercial at 18 inches in thickness.

Second note: This same farm (Sam Morris) at elevation of 1,075 and directly above the opening of examination No. 33 shows coal bloom at a fresh slip. This is probably the Hamlin coal but not being faced it could not positively be determined.

FIRE CLAY RIDER COAL ON CAM JOHNSON BRANCH.
This Domestic opening shows 45 inches of coal and a 14-inch shale parting at an altitude of 1010 feet.

Examination No. 34.

Property: John M. Begley farm.

Location: On the head of Paw Paw hollow of the right fork Gays Creek, Perry County, Ky.

Elevation: Coal 1,385 feet, A. T.

Description: Hindman or No. 9 coal. Excellent prospect opening. Impounded with water and could not drain to sample. This coal is 425 feet above the Fire Clay (No. 4) coal. Very limited area.

Coal Section: Sandstone roof.

23 in. coal.
2 in. black shale.
11 in. coal.
Shale (hard) bottom.

Examination No. 35.

Property: Johnson-Hogg Coal Co.

Location: On Eversole Creek up left hollow at Main Mine, Perry County, Kentucky.

Elevation: Coal, 1,150 feet, A. T.

Description: Haddix or No. 5 coal main mine entry, 100 feet in.

Coal Section: Slate roof.

24 in. coal.
Shale bottom.

Examination No. 36.

Property: Johnson-Hogg Coal Co.

Location: On Eversole Creek up left hollow at Main Mine, Perry County, Ky.

Elevation: Coal 1,250 feet, A. T.

Description: Hazard coal or No. 6. Main entry of mine 75 feet in. Coal sampled and analyses attached.

Coal Section: Shale roof.

15 in. coal.
1 in. black shale.
4 in. coal.
4 in. shale (hard) (jack rock).
16 in. coal.
Shale bottom.

Examination No. 37.

Property: Owner unknown.

Location: Head of right fork of Gays Creek at left of ford on hillside.

Elevation: Coal 1,350 feet, A. T.

Description: Francis coal or No. 8 coal bloom and water—unopened.

Examination No. 38.

Property: Owner unknown.

Location: Head of right fork of Gays Creek at left of road on hillside.

Elevation: Coal 1,315 feet, A. T.

Description: Flag or No. 7 coal bloom and water—unopened.

Examination No. 39.

Property: H. M. Begley heirs.

Location: Head of right fork of Gays Creek at left of road on hillside.

Elevation: Coal, 1,250 feet, A. T.

Description: Hazard or No. 6 coal. Sandstone roof badly fallen in. Old domestic opening could not measure as entry was closed. Reported 40 in.

Examination No. 40.

Property: Owner unknown.

Location: On left of Gays Creek, three-fourths mile above mouth, 8 feet above drainage under massive sandstone ledge, Perry County, Ky.

Elevation: Coal 770 feet A. T.

Description: Whitesburg or No. 3 coal. Old domestic opening underneath massive sandstone ledge. Not a commercial coal here.

Coal Section: Sandstone 30 feet massive.

1 foot shale (black) roof.

18 in. coal.

Shale bottom.

Analyses of the Coals.

In making the collections of samples for analysis, the coals were "channel sampled" down the entire face wherever it was possible to do so. In some "wet" openings only block samples could be taken. The analyses were made principally by W. D. Iler, under the direction of Dr. A. M. Peter, Chief Chemist at the State Agricultural Experiment Station, Lexington, Ky.

HAZARD COAL.

Analysis No. 1.

Coals (Nos. 1 and 2) received February 9, 1921, from W. R. Jillson, State Geologist, as follows:

Laboratory No. G-4043, labeled "Top 15 in. ridge seam 1,210 ft. on John Gross Farm on Middle Fork of Ky. River just below the mouth of Otter Creek, Perry County, Ky. Collected by W. R. Jillson, Feb. 5, 1921." Sample in two lumps.

Analysis No. 2.

Laboratory No. G-4044, labeled "Bottom 51 inches. Ridge seam 1,210 feet on John Gross farm on Middle Fork of Ky. River just below mouth of Otter Creek, Perry Co., Ky. Collected by W. R. Jillson, Feb. 5, 1921." Sample one large lump.

ANALYSES OF THE AIR-DRIED SAMPLE.

	Per cent.	
	G-4043	G-4044
Moisture	2.23	2.52
Volatile combustible matter	39.56	29.23
Fixed carbon	51.32	62.00
Ash	6.89	6.25
Total	100.00	100.00
Sulfur	4.51	1.50
B. T. U. per pound	12,500	12,800
Color of ash	Purplish-red	Reddish-buff

G-4043 Fuel ratio $\frac{51.32}{39.56} = 1:1.3$

G-4044 Fuel ratio $\frac{62.00}{29.23} = 1:2.1$

(Analyses by W. D. Iler)

WHITESBURG COAL.

Analysis No. 3.

Coal received February 10, 1921, from W. R. Jillson, State Geologist, as follows:

Laboratory No. G-4045, labeled "From the Jack Gross mine in right bank of Squabble Creek, Buckhorn, Perry County, Ky. Collected by W. R. Jillson, Feb. 6/21."

ANALYSIS.

	Air-dry	Moisture-free
Moisture	1.43	....
Volatile combustible matter	40.15	40.73
Fixed carbon	52.86	53.63
Light-gray ash	5.56	5.64
Total	100.00	100.00
Sulfur	1.85	1.88
B. T. U. per pound	13,840.	14,040.

Fuel ration = 1:1.3

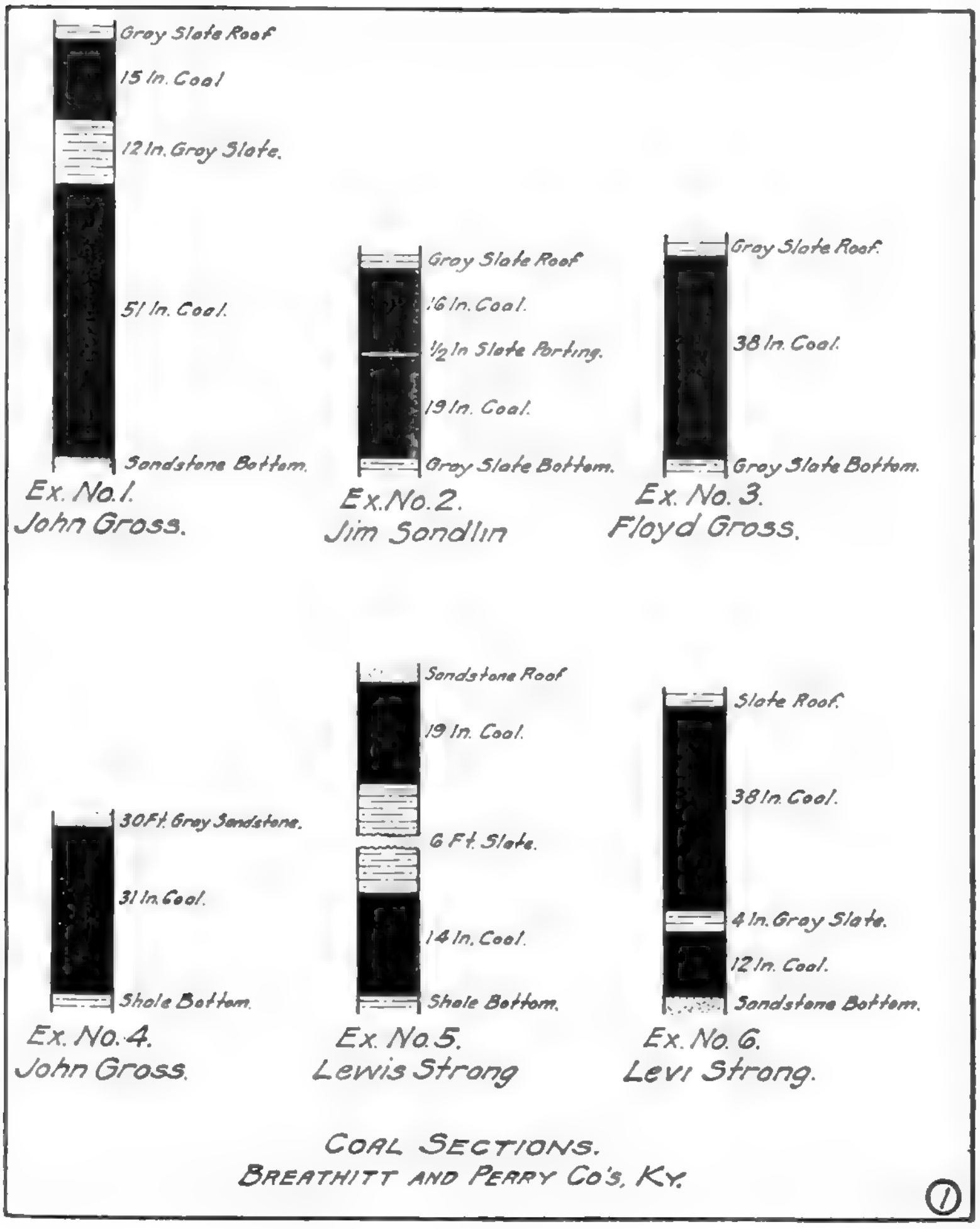
(Analysis by W. D. Iler.)

FIRE CLAY RIDER COAL.

Analysis No. 4.

Coal, received February 10, 1921, from W. R. Jillson, State Geologist, as follows:

Laboratory No. G-4046, labeled "From schoolhouse seam about 1,000 feet left bank of Squabble Creek, Buckhorn, Ky. Collected by W. R. Jillson, 2/7/21."


Gray Slate Roof
15 In. Coal
12 In. Gray Slate.
51 In. Coal.
Sandstone Bottom.
Ex. No. 1.
John Gross.
Gray Slate Roof
16 In. Coal.
½ In Slate Parting.
19 In. Coal.
Gray Slate Bottom.
Ex. No. 2.
Jim Sondlin
Gray Slate Roof.
38 In. Coal.
Gray Slate Bottom.
Ex. No. 3.
Floyd Gross.
30 Ft. Gray Sandstone.
31 In. Coal.
Shale Bottom.
Ex. No. 4.
John Gross.
Sandstone Roof
19 In. Coal.
6 Ft. Slate.
14 In. Coal.
Shale Bottom.
Ex. No. 5.
Lewis Strong
Slate Roof.
38 In. Coal.
4 In. Gray Slate.
12 In. Coal.
Sandstone Bottom.
Ex. No. 6.
Levi Strong.
COAL SECTIONS.
BREATHITT AND PERRY Co's, KY.
1

ANALYSIS.

	Air-dry	Moisture-free
Moisture	2.37	....
Volatile combustible matter	37.90	38.82
Fixed carbon	58.20	59.61
Greenish colored ash	1.53	1.57
Total	100.00	100.00
Sulfur	0.95	0.97
B. T. U. per pound	14,100.	14,440.

Fuel ratio=1:1.5

(Analysis by W. D. Iler.)

FIRE CLAY RIDER COAL.

Analysis No. 5.

Coal, received February 14, 1921, from W. R. Jillson, State Geologist, as follows:

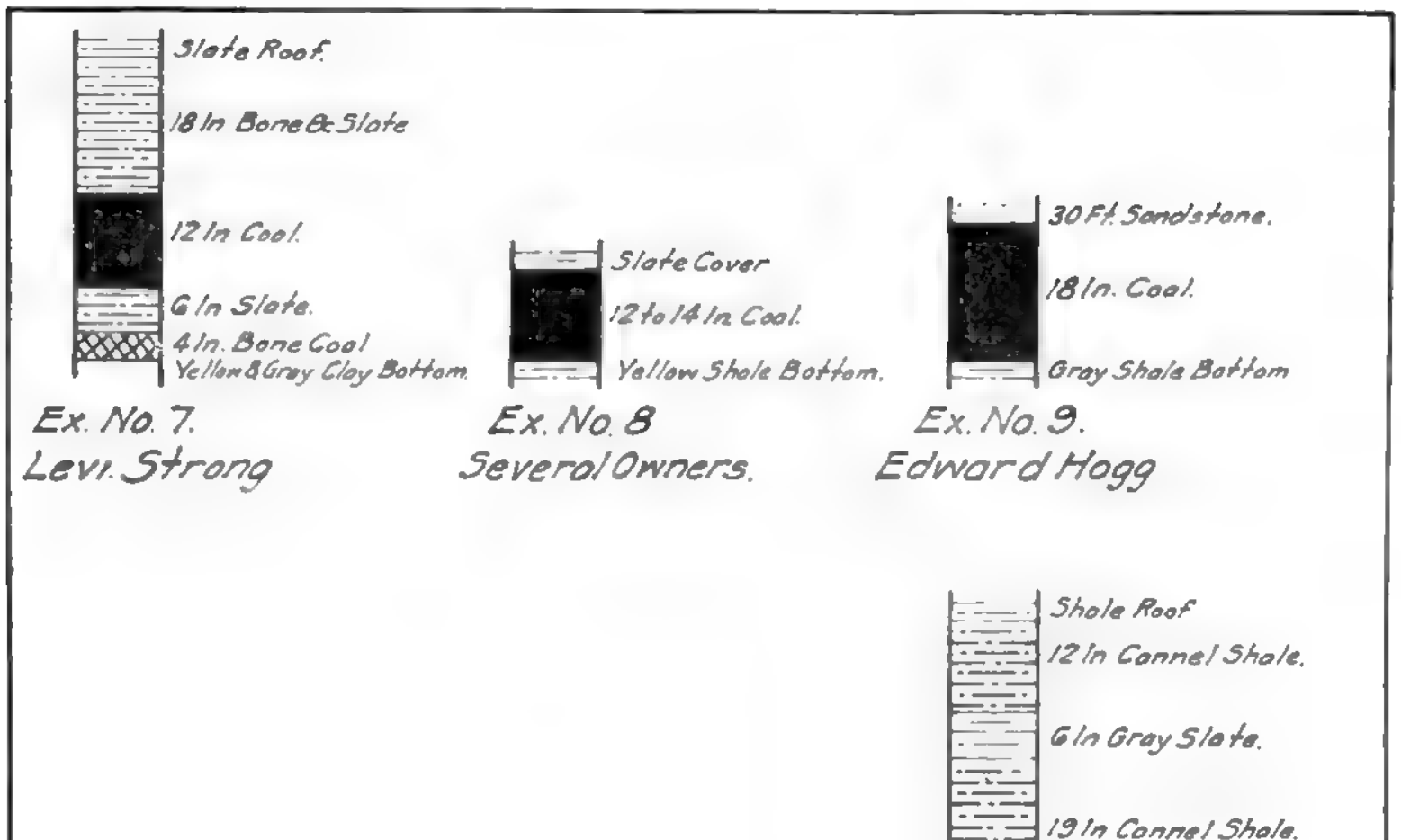
Laboratory No. G-4047, labeled "G. R. Johnson farm about 1,010 ft. on Cam Johnson Br. Collected by W. R. Jillson, Feb. 8/21. Perry Co., Ky."

ANALYSIS.

	Air-dry	Moisture-free
Moisture	1.96	....
Volatile combustible matter	36.23	36.95
Fixed carbon	56.93	58.07
Buff colored ash	4.88	4.98
Total	100.00	100.00
Sulfur	0.76	0.78
B. T. U. per pound	13,440.	13,710.

Fuel ration=1:1.6

(Analysis by W. D. Iler.)



WHITESBURG COAL.

Analysis No. 6.

Coal, received February 14, 1921, from W. R. Jillson, State Geologist, as follows:

Laboratory No. G-4048, labeled "Sample from Elihu Reynolds on Riley Fork of Long's Creek on Middle Fork of Kentucky River, Breathitt County, Ky. Collected by W. R. Jillson, 2/8/21. Abt. 750."

ANALYSIS.

	Air-dry	Moisture-free
Moisture	1.71	....
Volatile combustible matter	40.75	41.46
Fixed carbon	52.70	53.62
Purple colored ash	4.84	4.92
Total	100.00	100.00
Sulfur	3.45	3.51
B. T. U. per pound	13,470.	13,700.

Fuel ration = 1:1.3

(Analysis by W. D. Iler.)

FIRE CLAY COAL.

Analysis No. 7.

Coal, received February 14, 1921, from W. R. Jillson, State Geologist, as follows:

Laboratory No. G-4049, labeled "O. B. Anderson's farm, Buck Branch of Middle Fork of Kentucky River, 2 miles below Buckhorn, Ky. 2/8/21. Collected by W. R. Jillson."

ANALYSIS.

	Air-dry	Moisture-free
Moisture	2.03	....
Volatile combustible matter	36.62	37.37
Fixed carbon	59.53	60.77
Reddish colored ash	1.82	1.86
Total	100.00	100.00
Sulfur	0.84	0.86
B. T. U. per pound	14,090.	14,380.

Fuel ration = 1:1.6

(Analysis by W. D. Iler.)

FIRE CLAY RIDER COAL.

Analysis No. 8.

Coal, received February 14, 1921, from W. R. Jillson, State Geologist, as follows:

Laboratory No. G-4050, labeled "Sample from 30 feet inside main entry of upper mine of Deaton Coal Co., one-half mile above mouth of Bush Branch of the North Fork of the Kentucky River, Breathitt County, Ky., Bar. Alt. 940 feet. Collected by W. R. Jillson, 2/9/21."

ANALYSIS.

	Air-dry	Moisture-free
Moisture	2.41	....
Volatile combustible matter	34.85	35.71
Fixed carbon	58.18	59.62
Pinkish-gray ash	4.56	4.67
Total	100.00	100.00
Sulfur	0.91	0.93
B. T. U. per pound	13,390.	13,720.

Fuel ratio = 1:1.7

(Analysis by W. D. Iler.)

FIRE CLAY RIDER COAL.

Analysis No. 9.

Coal, received February 14, 1921, from W. R. Jillson, State Geologist, as follows:

Laboratory No. G-4051, labeled "Sample of coal from whole face 8 feet, head of entry on the G. B. Turner farm, 1 mile from head of Bowling's Creek, Alt. 945 ft. Breathitt Co., Ky. Collected by W. R. Jillson, 2/9/21."

ANALYSIS.

	Air-dry	Moisture-free
Moisture	1.93	....
Volatile combustible matter	30.82	31.43
Fixed carbon	54.31	55.38
Light-gray ash	12.94	13.19
Total	100.00	100.00
Sulfur	1.18	1.20
B. T. U. per pound	12,180.	12,420.

Fuel ratio = 1:1.8

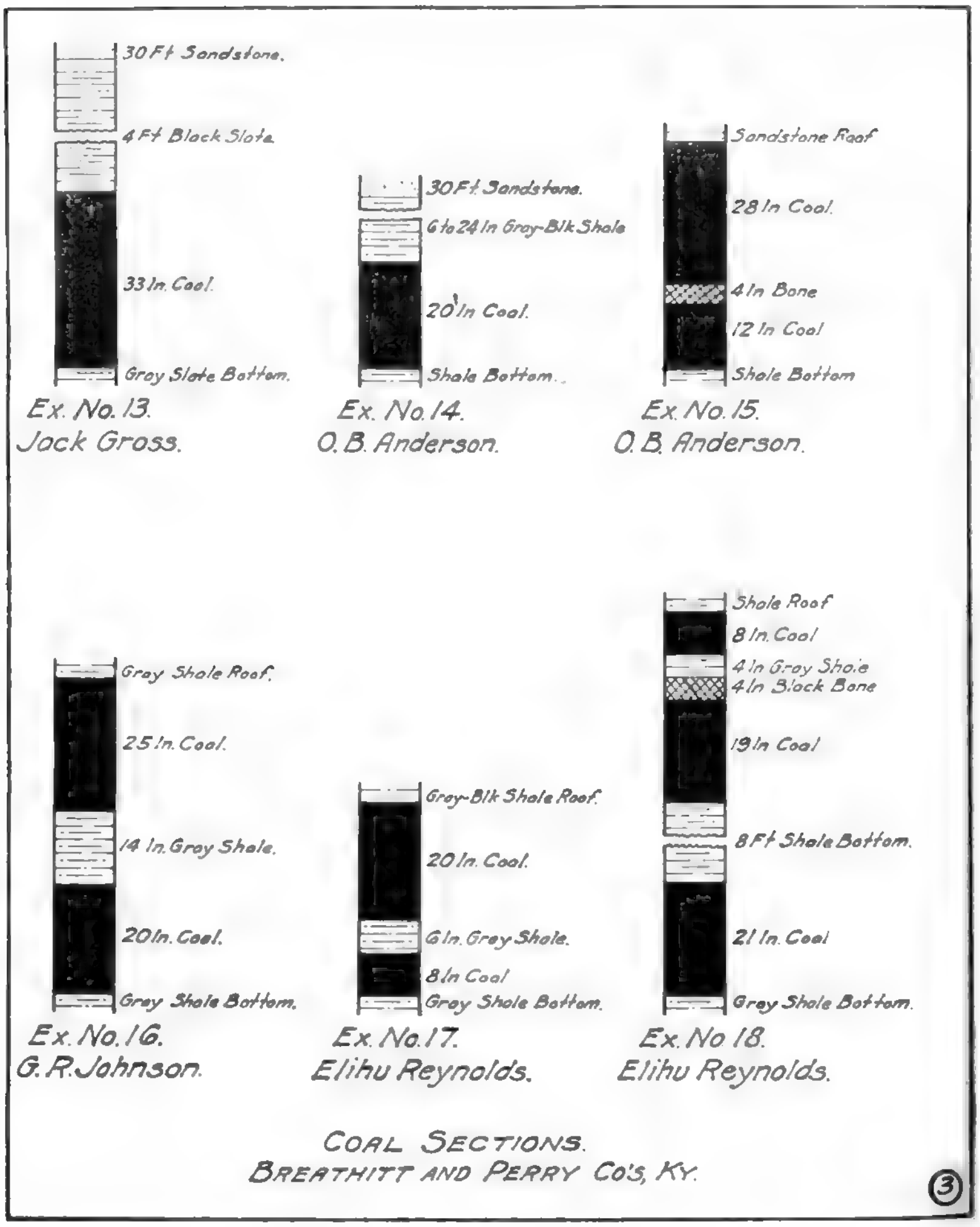
(Analysis by W. D. Iler.)

HAZARD COAL.

Analysis No. 10.

Coal, received February 14, 1921, from W. R. Jillson, State Geologist, as follows:

Laboratory No. G-4052, labeled "Sample of 'gray splint' from below lower shale parting taken from poorly faced domestic opening on the Berry Turner, Sr., farm located on headwaters of the Groundhog Branch of Long's Creek of the Middle Fork of the Kentucky River, Breathitt County, Ky. Bar. Alt. 1,075 feet. Collected by W. R. Jillson, 2/9/21."


30 Ft Sandstone.
4 Ft Black Slate.
33 In. Coal.
Gray Slate Bottom.
Ex. No. 13.
Jock Gross.
30 Ft. Sandstone.
6 to 24 In Gray-Blk Shale
20 In Coal.
Shale Bottom.
Ex. No. 14.
O. B. Anderson.
Sandstone Roof
28 In Coal.
4 In Bone
12 In Coal
Shale Bottom
Ex. No. 15.
O. B. Anderson.
Gray Shale Roof.
25 In. Coal.
14 In. Gray Shale.
20 In. Coal.
Gray Shale Bottom.
Ex. No. 16.
G. R. Johnson.
Gray-Blk Shale Roof.
20 In. Coal.
6 In. Gray Shale.
8 In Coal
Gray Shale Bottom.
Ex. No. 17.
Elihu Reynolds.
Shale Roof
8 In. Coal
4 In Gray Shale
4 In Black Bone
19 In Coal
8 Ft Shale Bottom.
21 In. Coal
Gray Shale Bottom.
Ex. No 18.
Elihu Reynolds.
COAL SECTIONS.
BREATHITT AND PERRY CO'S, KY.
3

ANALYSIS.

	Air-dry	Moisture-free
Moisture	2.15	....
Volatile combustible matter	36.01	36.80
Fixed carbon	54.69	55.89
Reddish-gray ash	7.15	7.31
Total	100.00	100.00
Sulfur	1.66	1.70
B. T. U. per pound	12,880.	13,170.

Fuel ratio = 1:1.5

(Analysis by W. D. Iler.)

HAZARD COAL.

Analysis No. 11.

Coal, received April 23, 1921, from W. R. Jillson, State Geologist. Laboratory No. G-4054, labeled "Sample of coal stripped from entire face of coal No. 6 from the Johnson-Hogg property 1 mile up from mouth of creek on left of Eversole Creek, Perry County, Kentucky. Collected by W. R. Jillson, April 21, 1921."

ANALYSIS.

	Air-dry	Moisture-free
Moisture	4.49	....
Volatile combustible matter	30.51	31.94
Fixed carbon	54.72	57.30
Ash	10.28	10.76
Total	100.00	100.00
Sulfur	0.79	0.81
B. T. U. per pound	11,770.00	12,320.00
Color of ash	pink	
Fuel ratio $\left\{\begin{array}{l}\text{fixed carbon}\\ \text{volatile combustible matter}\end{array}\right.$	1.8	

(Analysis by W. D. Iler.)

FIRE CLAY COAL.

Analysis No. 12.

Coal, received April 23, 1921, from W. R. Jillson, State Geologist. Laboratory No. G-4055, labeled "Sample from entire face of No. 4 or Fire Clay coal from the entire coal face of Johnson-Hogg Co. mines on Eversole Creek, at left one mile above mouth of Creek. Sample collected by W. R. Jillson from face of main entry 2,300 feet in April 20, 1921. Perry County, Kentucky."

ANALYSIS.

	Air-dry	Moisture-free
Moisture	3.12	....
Volatile combustible matter	34.06	35.16
Fixed carbon	58.36	60.24
Ash	4.46	4.60
Total	100.00	100.00
Sulfur	1.08	1.11
B. T. U. per pound	13,180.00	13,500.00
Color of ash	Yellowish gray	
Fuel ratio $\left\{\begin{array}{l}\text{fixed carbon}\\\text{volatile combustible matter}\end{array}\right\}$	1.7	

(Analysis by W. D. Iler.)

FIRE CLAY COAL.

Analysis No. 13.

Coal, received April 23, 1921, from W. R. Jillson, State Geologist. Laboratory No. G-4056, labeled "Sample of No. 4 or Fire Clay coal Rider from Ballinger-Jones Co. mine, mouth of Eversole Creek, north fork Kentucky River, Perry County, Kentucky. Collected by W. R. Jillson, from entire face of coal. April 20, 1921."

ANALYSIS.

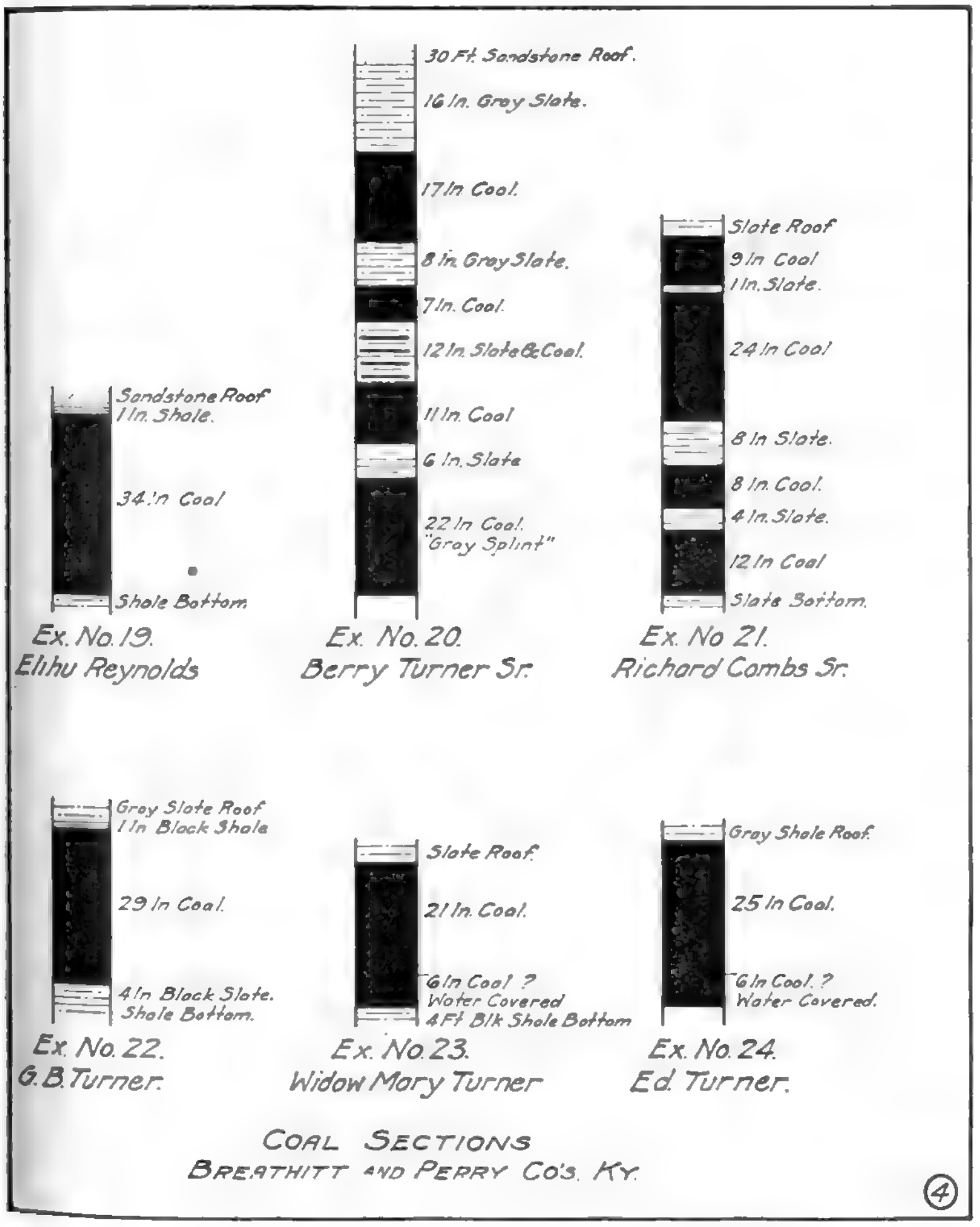
	Air-dry	Moisture-free
Moisture	2.81	....
Volatile combustible matter	37.39	38.47
Fixed carbon	53.36	54.90
Ash	6.44	6.63
Total	100.00	100.00
Sulfur	1.15	1.18
B. T. U. per pound	12,910.00	13,270.00
Color of ash	Very light brown	
Fuel ratio $\left\{\begin{array}{l}\text{fixed carbon}\\\text{volatile combustible matter}\end{array}\right\}$	1.4	

(Analysis by W. D. Iler.)

FIRE CLAY COAL.

Analysis No. 14.

Coal received April 23, 1921, from W. R. Jillson, State Geologist. Laboratory No. G-4057, labeled "Sample stripped from entire face of No. 4 or Fire Clay coal, 30 feet back in main entry of domestic opening on the farm of Sam Morris, left fork of Gays Creek, Perry Co., Ky. Collected by W. R. Jillson, 4/21/21."


30 Ft. Sandstone Roof.
16 In. Grey Slate.
17 In Coal.
8 In. Grey Slate.
7 In. Coal.
12 In. Slate & Coal.
11 In Coal
6 In. Slate
22 In Coal. "Gray Splint"
Sandstone Roof
11 In. Shale.
34 In Coal
Shale Bottom.
Ex. No. 19. Elihu Reynolds
Ex. No. 20. Berry Turner Sr.
Slate Roof
9 In Coal
1 In. Slate.
24 In Coal
8 In Slate.
8 In. Coal.
4 In. Slate.
12 In Coal
Slate Bottom.
Ex. No 21. Richard Combs Sr.
Gray Slate Roof
11 In Black Shale
29 In Coal.
4 In Black Slate.
Shale Bottom.
Ex. No. 22. G. B. Turner.
Slate Roof.
21 In. Coal.
6 In Coal ?
Water Covered
4 Ft Blk Shale Bottom
Ex. No. 23. Widow Mary Turner
Gray Shale Roof.
25 In Coal.
6 In Coal. ?
Water Covered.
Ex. No. 24. Ed. Turner.
COAL SECTIONS
BREATHITT AND PERRY CO'S. KY.
4

ANALYSIS.

	Air-dry	Moisture-free
Moisture	3.83	....
Volatile combustible matter	33.07	34.39
Fixed carbon	57.65	59.95
Ash	5.45	5.66
Total	100.00	100.00
Sulfur	0.70	0.73
B. T. U. per pound	12,920.00	13,430.00
Color of ash	flesh colored	
Fuel ratio $\left\{\begin{matrix}\text{fixed carbon}\\ \text{volatile combustible matter}\end{matrix}\right\}$	1.7	

(Analysis by W. D. Iler.)

FIRE CLAY COAL.

Analysis No. 15.

Coal received April 26, 1921, from W. R. Jillson, State Geologist. Laboratory No. G-4058, labeled "Channel Stripped sample of No. 4 or Fire Clay coal from the Joseph Sandlin farm on the headwaters of Gays Creek, Perry County, Ky. Collected by W. R. Jillson, State Geologist, April 22, 1921."

ANALYSIS.

	Air-dry	Moisture-free
Moisture	2.67	....
Volatile combustible matter	31.96	32.83
Fixed carbon	59.16	60.79
Ash	6.21	6.38
Total	100.00	100.00
Sulfur	0.84	0.86
B. T. U. per pound	13,060.00	13,420.00
Color of ash	Very light gray	
Fuel ratio $\left\{\begin{matrix}\text{fixed carbon}\\ \text{volatile combustible matter}\end{matrix}\right\}$	1.85	

(Analysis by W. D. Iler)

FLAG AND FIRE CLAY COALS.

Analysis Nos. 16 and 17.

Two coals received June 25, 1921, from W. R. Jillson, State Geologist, from the Johnson-Hogg Coal Company, Chavies, Perry County, Ky.

Laboratory No. G-4060, labeled "Hazard No. 4 or Fire Clay coal, J. E. Johnson, 623 East High St., Lexington, Ky."

Laboratory No. G-4061, labeled "No. 7 (Flag) coal, J. E. Johnson, 623 East High St., Lexington, Ky."

ANALYSIS OF THE AIR DRY SAMPLE.

	Per cent.	
	Fire Clay Coal G-4060	Flag Coal G-4061
Moisture	2.40	2.26
Volatile combustible matter	35.90	32.96
Fixed carbon	57.41	46.15
Ash	4.29	18.63
Total	100.00	100.00
Color of ash	Yellowish-gray	Grayish brown
Sulfur	0.92	1.06
B. T. U. per pound	13,170.00	10,430.00

(Analyses by W. D. Ller and S. D. Averitt)

EVALUATION AND COMMERCIALIZATION OF THE MIDDLE FORK COALS.

As a result of the field investigations made, several of the eleven separate coals of this section are found to be commercial in the Buckhorn region on the waters of the Middle Fork of the Kentucky River and its tributaries. The recommendations made are based upon faithful measurements and accurate analyses.

Of chief commercial importance in this area, due to its thickness, lower elevation, and hence larger tonnage, is the No. 4, or Fire Clay coal. On the Middle Fork and its tributaries this coal is about 50 feet higher in the hills than it is on the North Fork of the Kentucky River, due to a deeper incision in this same figure of the drainage of the Middle Fork as compared to that of the North Fork. Acreages, therefore, of the No. 4 coal are somewhat less on the Middle Fork drainage than on the North Fork drainage. On Gays Creek the Fire Clay coal varies between 39 and 49 inches in thickness, thereby showing much less irregularity than it does on the Eversole Creek, where in the mines of the Johnson-Hogg Coal Company it was measured at 92 inches of clean coal at a maximum, and ranged down to 53 inches, as a minimum. It always shows a black, very hard "Jack rock" parting, which averages from 3 to 8 inches on Eversole Creek but is con-

LOG TRANSPORTATION ON LONG'S CREEK.
During the periods of low water, oxen are used to transport the best timber from the heads of the creeks to the river.

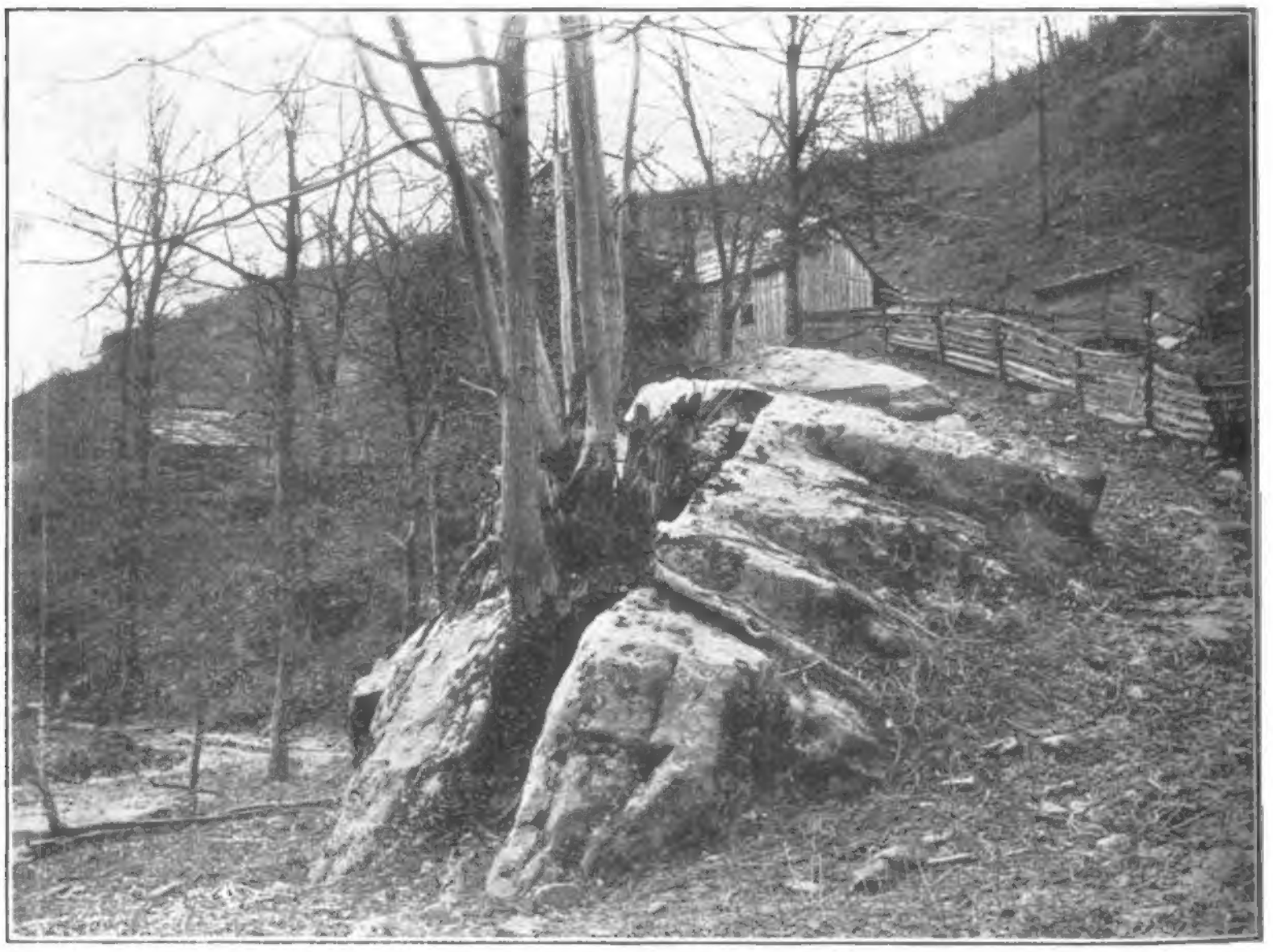
siderably less on the Middle Fork. On Gays Creek the Fire Clay coal shows low in sulphur at .70; low in ash at 5.45, and medium in B. T. U.'s at 12,920. An analysis of the Fire Clay coal from the Joseph Sandlin farm on the head of Gays Creek shows it to be low in sulphur at .84; medium in ash at 6.21; and fairly high in B. T. U.'s at 13,060. The analysis as given for the Sam Moore's farm mine compares favorably with that of Sandlin's farm, the sulphur being lower at .70; the ash lower at 5.45; and B. T. U.'s lower at 12,920.

The coals of second importance to the Fire Clay coal are (1) the Fire Clay Rider coal, generally found from 20 to 40 feet above the Fire Clay coal, and averaging about 35 inches in thickness of clean coal, and (2) the Hazard or No. 6 coal, about 250 feet higher, which ranges between 40 and 66 inches with partings. The 40 inch thickness is reported from the completely fallen in structure upon the head of Gays Creek, and the 66-inch thickness was measured in the John Gross mine at the mouth of Gays and Otter Creeks on the Middle Fork

BUSH BRANCH, BREATHITT COUNTY, KY.

The view is nearly east toward the North Fork of the Kentucky River and well illustrates the human geography of the creeks of the Cumberland Plateau in Kentucky.

of the Kentucky River. The Hazard coal is very low in sulphur, but high at 10.28 in ash; and low in B. T. U.'s at 11,700. At an elevation of 1210 the largest acreage of the Hazard coal would be found up toward the head of the creeks and away from the Middle Fork itself, where the hills are somewhat lower. The Hazard coal is being operated by the Johnson-Hogg Coal Company on Eversole Creek. The Fire Clay Rider coal might be worked in conjunction with the Fire Clay coal, but it is not regarded as a commercial coal except in very restricted locations when taken separately.



VICTOR AND VANQUISHED.

The fierce struggle for existence is not confined to the animal kingdom. Here on Gay's Creek is a concrete example of the titanic strength of a white walnut sapling sprouted in the heart of a great block of Pottsville sandstone. Vegetation is one agent of rock weathering and decay.

The higher coals known to exist and examined within the area of this report will not be further discussed here, since they are considered to be of either too limited an acreage, or to have offered at this time too meager information, to warrant an authoritative generalization. These coals have already

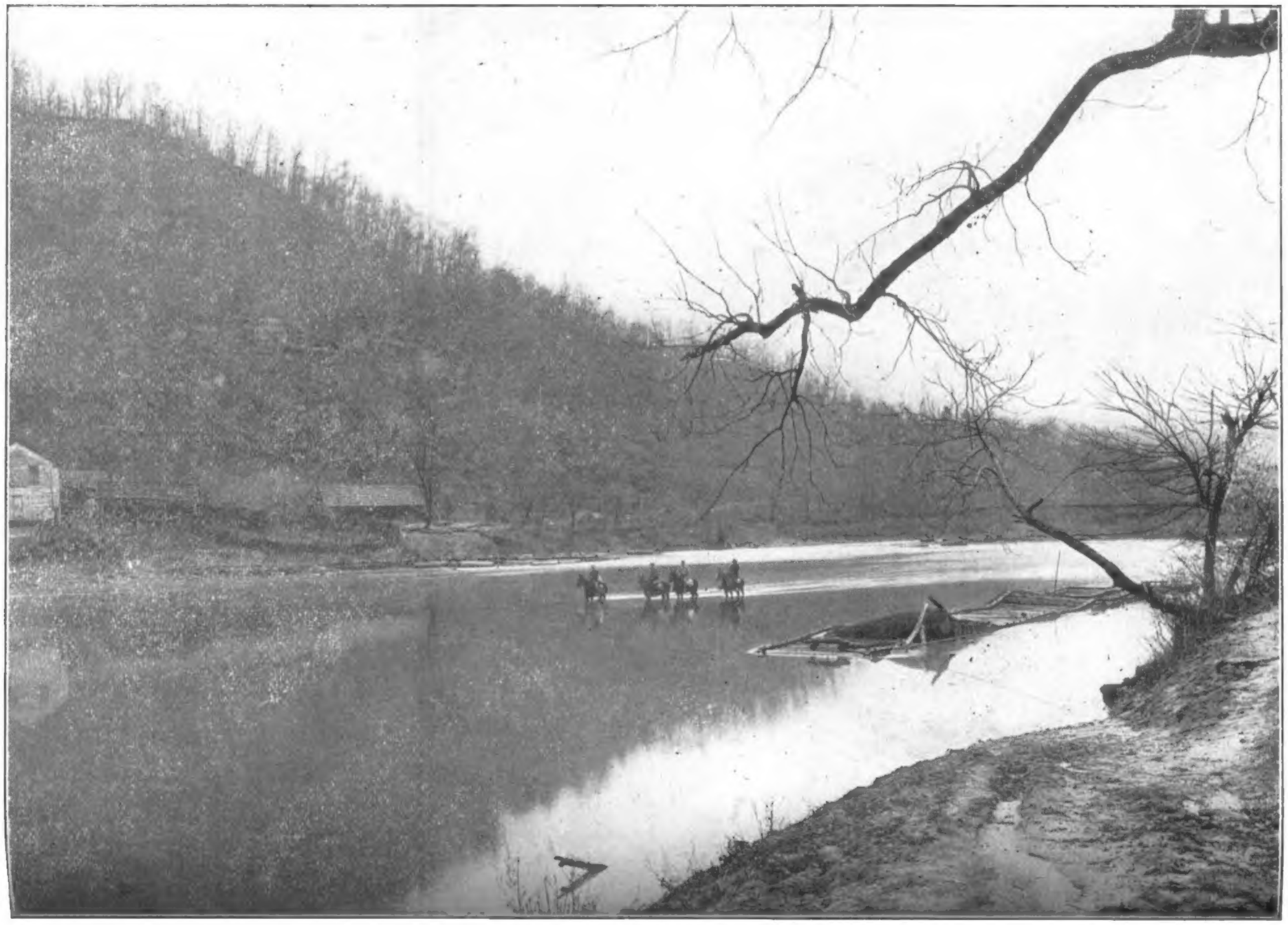
been listed in sequence, and the detail of their occurrence has been recorded as separate examinations and analyses, to which the reader is referred for further information.

Aggregate Tonnage and Value.

For the entire area considered, which is figured at about 56 square miles, a thickness of 4 feet of coal is regarded as present and of commercial importance. This estimate, however, is low, rather than high. In many parts of this area, the total section of commercial coals can be measured to upwards of 6 and 7 feet. Figured, however, at 4 feet to the acre, 6,244,761,600 cubic feet for the area discussed is secured. This volume of coal, divided by the recognized bituminous coal factor of 24.6, gives a total of 253,852,097 short tons for this same area. This tonnage, if figured at a value of 1 penny per ton in the ground, which is commonly done in Kentucky, will give the enormous yet conservative value of $2,538,520.97 for the unmined coal considered within this report.

Transportation.

With the coals of this section definitely correlated, recognized, and appraised, the only deterrent factor to their immediate development and commercialization lies in the means of transportation. During the late 90's the stream flow of the Middle Fork of the Kentucky River was somewhat more uniform than at the present, due to the fact that the forest cover had not been so thoroughly removed. About this time a considerable amount of coal was annually moved from this section, in flat boats, down the river to Beattyville and beyond. With the development, however, of rail transportation up the North Fork of the Kentucky River, and the opening of the great Hazard and Elkhorn fields, the coals on the Middle Fork soon lost out in competition. The few small mines which were then operated close to the Middle Fork of the Kentucky River in this flat boat traffic were rapidly abandoned, and the industry became shortly a matter of history.



A KENTUCKY RIVER FORD.

There are no bridges above or below Burnham for miles. This ford of the High Bank of the Kentucky River is at the Mouth of Lower Creek.

Could new rail transportation be directed up the Middle Fork of the Kentucky River, either from Athol on the L. & N. Railroad, or from some other convenient higher point on the North Fork, the coals of the section adjacent to Buckhorn, and those farther up the Middle Fork in Leslie county, would become commercial at once, and prove a great and valuable additional mineral resource to this unexploited portion of the Eastern Kentucky Coal Field. Considered in a broad, general way, the coals improve in character and thickness as one progresses up the Middle Fork towards the head of the river, and any line projected into this section should take fully into consideration this very important point.